

## LETTER TO THE EDITOR

## A review of nail findings associated with COVID-19 infection

According to recent data, up to 20% of patients with COVID-19 have cutaneous manifestations. Nails can also develop abnormalities during and after infection. In this article, we review the nail findings observed in patients with COVID-19.

We reviewed the PubMed and Embase databases to identify all articles up to May 2021 that have described nail findings in association with COVID-19.

A total of 70 studies were reviewed including 61 studies on chilblain-like lesions, which are one of the most widely identified cutaneous findings associated with the COVID-19 pandemic.

Nine studies described specific nail findings (Table 1). Three of these findings [Beau lines,<sup>1</sup> transverse leukonychia,<sup>1,2</sup> and onychomadesis (Figure 1a)] are commonly seen with other systemic disease, including viral infection, and are likely the consequence of high fever and/or severe illness. One finding, paronychia, was seen in association with chilblain-like lesions,<sup>3</sup> and three nail findings (the red half-moon sign<sup>4,5</sup> (Figure 1d), the transverse orange discoloration<sup>6</sup> and the diffuse red-white nail bed discoloration<sup>7</sup>) are novel and potentially related to the microvascular injury due to COVID-19. Of note, an orange-brownish discoloration of the nail in a transverse pattern, the most similar finding to date, has been described in patients with Kawasaki disease, which shares a similar inflammatory response component to COVID-19.

COVID-19's effects on the nail blood vessels were documented by Navarro *et al.* in 12 pediatric patients with COVID-19-related chilblains, described in Table 1.<sup>8</sup> At dermoscopy of the nail fold and hyponychium, they found a red background with globules, indicative of vascular damage.

We also documented dilated and tortuous capillaries at dermoscopy in a patient with transverse leukonychia after COVID-19 infection (Figure 1c).

The presence of microvascular abnormalities was confirmed by a capillaroscopy study of the nails of 82 patients, enrolled during hospitalization for COVID-19 (28), or shortly after discharge.<sup>9</sup> Using nail video capillaroscopy (NVC), the authors observed microvascular abnormalities in all patients, which are described in detail in Table 1. Findings varied between acutely ill

and discharged patients, providing visual evidence of a vascular pathogenic component to COVID-19 infection.

Chilblain-like lesions are a commonly reported manifestation involving the digits. They are also known as 'COVID toes,' even though they can also affect fingers, and they present as erythematous, purpuric, papules and macules on the dorsal phalanges, nail folds and digital pulps (Figure 1b). Chilblain-like lesions are predominantly found in children and adolescents. Nail findings have been reported in association with chilblain-like lesions. In a prospective study conducted by Docampo-Simon *et al.*, two patients with chilblain-like lesions also presented with paronychia.<sup>3</sup> A causative link between COVID-19 and chilblains has not been firmly established despite an increase in the prevalence of these lesions during the pandemic.

Studies suggest that this well-known manifestation of COVID-19 infection may be the consequence of an exacerbated INF- $\alpha$  response. Very few patients presenting with chilblain-like lesions have other symptoms of COVID-19 infection, and only a few test positive for the infection when presenting with the lesions. It has been suggested that the overproduction of INF- $\alpha$ , which is produced at declining rates with age, may lead to rapid control of viral infection, thereby protecting younger patients from more severe disease and resulting in lower rates of positive nasopharyngeal swabs. The study by Hubiche *et al.*<sup>10</sup> also demonstrates that an increase in INF- $\alpha$  in patients with chilblain-like lesions could help young patients clear the virus rapidly. Other nail findings described in patients with chilblains include periungual erythema, peeling around the nail, nail fold telangiectasia and erythematous macules around the distal nail folds.

Our review of the literature did not reveal an association of nail disease with poor outcome for patients.

### Acknowledgements

The patients in this manuscript have given written informed consent to the publication of their case details.

### Conflicts of interest

Dr. Tosti acts as a consultant for DS Laboratories, Monat Global, Almirall, Tirty Madison, Eli Lilly, Leo Pharmaceuticals, Bristol Myers Squibb and P&G. Dr. Morrison and Edward Haddeler have nothing to disclose.

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**Table 1** Nail findings described during the COVID-19 pandemic, including studies documenting nail findings associated with COVID-19 infection and studies describing nail involvement in patients with chilblain-like lesions

| Nail finding<br>Study title  | Author, month,<br>year, country              | Patient<br>characteristics | COVID-19 disease<br>course/associated<br>symptoms<br>and treatment  | Onset of nail<br>symptoms and<br>resolution  | Detailed description<br>of cutaneous and nail findings  | Time to nail<br>symptom<br>resolution | Additional<br>Comments   |
|--|--|----------------------------|---|--|---|---------------------------------------|--|
| <b>Studies documenting nail findings associated with COVID-19</b>  |  |                            |   |  |   |                                       |  |
| Beau lines and<br>leukonychia<br><i>Beau's Lines and<br/>Leukonychia in a<br/>COVID-19 Patient</i><br>Case report                            | Ide, November,<br>2020, Japan                | 68 years<br>old, male      | 18-day hospital stay, received<br>hydroxychloroquine<br>400 mg/day for 7 days,<br>methylprednisolone 0.5 mg/<br>kg/day for 5 days.  | 1.5 months after<br>diagnosis of<br>COVID-19   | White horizontal nail striae and<br>sunken nails clinically defined as<br>leukonychia and Beau lines  | Unknown                               |  |
| Beau lines<br><i>Beau lines associ-<br/>ated with COVID-19</i><br>Case report  | Albaida,<br>September,<br>2020, Canada*      | 45 years<br>old, male      | Presented with diarrhea, fever,<br>shortness of breath. Symptoms<br>lasted 10 days and no hospital<br>admission was required.   | Horizontal grooves over fingernails<br>and toenails, most noticeably over<br>his great toenails bilaterally, with a<br>horizontal groove 5 mm from the<br>proximal nailfold, clinically defined<br>as Beau lines | Horizontal grooves over fingernails<br>and toenails, most noticeably over<br>his great toenails bilaterally, with a<br>horizontal groove 5 mm from the<br>proximal nailfold, clinically defined<br>as Beau lines                    | Unknown                               | Toenail growth<br>(approximately<br>1.62 mm per<br>month) used<br>to link distance<br>of Beau lines<br>from proximal<br>nailfold to time<br>of COVID-19<br>infection |
| Transverse<br>leukonychia<br><i>Transverse leukony-<br/>chia (Mees' lines) nail<br/>alterations in a<br/>COVID-19 patient</i><br>Case report | Fernandez-Nieto,<br>November,<br>2020, Spain | 47 years<br>old, male      | Admitted to hospital with mild<br>COVID-19 bilateral pneumonia,<br>treated with lopinavir/ritonavir<br>100mg/400mg BID for 10 days<br>with good response and no<br>need for oxygen. Labs notable<br>for mild lymphopenia (830<br>cells/ $\mu$ L, range 1000–4500<br>cells/ $\mu$ L) and slight elevation of<br>D-dimer (1330 ng/mL, range 0<br>–500 ng/mL). | 5 days after<br>diagnosis of<br>COVID-19   | Transverse, non-blanchable white<br>lines on all fingernails, which<br>progressively migrated with the<br>growth of the nail and persisted at<br>time of visit, clinically defined as<br>Mees' lines, or transverse<br>leukonychia. | Unknown                               |  |
| Onychomadesis<br><i>Onychomadesis fol-<br/>lowing COVID-19<br/>infection: Is there a<br/>relationship?</i><br>Case report                    | Senturk,<br>November,<br>2020, Turkey*       | 47 years<br>old, female    | Patient was hospitalized and<br>received hydroxychloroquine,<br>azithromycin, oseltamivir, and<br>ceftriaxone.  | 3 months after<br>hospitalization<br>for COVID-19  | Finger and toenails were detached,<br>and new healthy nails were<br>growing from the proximal matrix,<br>clinically defined as<br>onychonadesis   | Unknown                               | Patient had<br>pre-existing<br>hypertension<br>and diabetes<br>mellitus,<br>continued these<br>medications<br>during hospital<br>course                              |

**Table 1** Continued

| Nail finding  | Author, month, year, country        | Patient characteristics | COVID-19 disease course/associated symptoms and treatment  | Onset of nail symptoms and resolution               | Detailed description of cutaneous and nail findings   | Time to nail symptom resolution  | Additional Comments |
|---|-------------------------------------|-------------------------|--|---|---|--|---------------------|
| Orange discoloration in transverse pattern<br><i>Transverse orange nail lesions following SARS-CoV-2 infection</i><br>Case report | Tammari, December, 2020, Italy      | 89 years old, female    | Patient presented with cough and asthma. A nasal PCR was negative for COVID-19. 16 weeks later the patient presented with orange nail discolorations. A blood test was positive for IgG against SARS-CoV-2 and ferropenic anemia. She also developed sarcopenia at this time   | 16 weeks after initial symptoms                     | Orange discolorations at the end of nail beds, following the shape of the lunula  | Unchanged one month following the discovery of the nail discolorations |                     |
| Convex red half-moon<br><i>The red half-moon nail sign: a novel manifestation of coronavirus infection</i><br>Case report         | Neri, November, 2020, Italy         | 60 years old, female    | Patient presented with history of fever (>38 degrees Celsius) and cough. 7 days after these symptoms the patient had dyspnea associated with anosmia and ageusia. The patient had a normal chest x-ray, but chest CT showed bilateral ground-glass opacities, leading to a diagnosis of bilateral interstitial pneumonia. Diagnosis was confirmed by nasal PCR swab. | 2 weeks after initial onset of symptoms of COVID-19 | Distally convex half-moon shaped red band surrounding the distal margin of the lunula appeared on all nails, denied associated symptoms and no other skin manifestations. One month follow up, bands still present and wider. | Ongoing at follow up one month after initial presentation              |                     |
| Convex red half-moon<br><i>COVID-19 and nail manifestation: be on the lookout for the red half-moon nail sign</i><br>Case report  | Méndez-Flores, August, 2020, Mexico | 37 years old, female    | Patient presented with anosmia, dry cough, persistent fever, relatively normal O <sub>2</sub> saturation (>92%), positive nasal swab PCR confirmed SARS-CoV-2 infection. Managed at home, no oxygen therapy required.  | 2 days after initial onset of symptoms of COVID-19  | Red-violet bands in the nail bed, above the nail lunula   | 1 week after initial presentation                                      |                     |

**Table 1** Continued

| Nail finding<br>Study title   | Author, month,<br>year, country     | Patient<br>characteristics                                       | COVID-19 disease<br>course/associated<br>symptoms<br>and treatment   | Onset of nail<br>symptoms and<br>resolution                      | Detailed description<br>of cutaneous and nail findings   | Time to nail<br>symptom<br>resolution | Additional<br>Comments |
|---|-------------------------------------|--|--|--|--|---------------------------------------|------------------------|
| Red-white nailbed<br>discoloration<br><i>Heterogenous red-<br/>white discoloration of<br/>the nail bed and dis-<br/>tal onycholysis in a<br/>patient with COVID-<br/>19</i>   | Demir, May,<br>2021, Turkey         | 23 years<br>old, male  | Patient presented with history<br>of fever, sore throat and joint<br>pain, four months prior to onset<br>of nail discoloration.  | 4 months after initial<br>onset of symptoms<br>onset of COVID-19 | Heterogenous red-white<br>discoloration in all nails; two round<br>onycholytic areas surrounded by<br>erythema in the distal part of the<br>second nail on the left hand   | Unknown                               |                        |
| <i>Case report</i>  | Natalello,<br>January, 2021, Italy  | 82 patients<br>(mean age<br>58.8 ± 13.2<br>years,<br>68.3% male) | Patients were affected by<br>COVID-19 pneumonia,<br>diagnosed by laboratory test<br>(nasopharyngeal PCR) and<br>suggestive chest imaging.<br>(n, %): (11, 13.4%) smoked,<br>(25, 30.5%) had hypertension,<br>(9, 11%) had diabetes, (4,<br>4.9%) had rheumatic disease,<br>(50, 61%) had a BMI > 25kg/<br>m <sup>2</sup> , (8, 9.8%) had acral symp-<br>toms, (47, 57.3%) required<br>oxygen therapy, (5, 6.1%) were<br>admitted to the ICU (21,<br>25.6%) received Anti-IL6R<br>therapy, (39, 47.5%) received<br>enoxaparin therapy, (8, 9.8%)<br>had PTE or DVT. | Duration from<br>onset of<br>symptoms<br>was 37.3 ±<br>23.1 days | Abnormalities classifiable as non-<br>specific patterns in 53 patients<br>(64.6%).<br>Findings: Precapillary edema<br>(80.5%), enlarged capillaries<br>(61%), sludge flow (53.7%), mean-<br>dering capillaries and reduced cap-<br>illary density (50%).<br>Acute COVID-19 patients, com-<br>pared to recovered patients,<br>showed higher prevalence of<br>hemisiderin deposits as a result of<br>micro-hemorrhages ( $p = .027$ ),<br>micro-thrombosis ( $p < 0.016$ ),<br>sludge flow ( $p = 0.001$ ) and pre-<br>capillary edema ( $p < 0.001$ ).<br>Recovered patients showed higher<br>prevalence of enlarged capillaries<br>( $p < 0.001$ ), loss of capillaries<br>( $p = 0.002$ ), meandering capillaries<br>( $p < 0.001$ ), and empty dermal<br>papillae. | Unknown                               |                        |
| <i>Nailfold video<br/>capillaroscopy (NVC)<br/>findings in patients<br/>with coronavirus<br/>disease 2019</i><br><i>Nailfold capil-<br/>laroscopy findings in<br/>patients with coro-<br/>navirus 2019: Broad-<br/>ening the spectrum of<br/>COVID-19 microvas-<br/>cular involvement<br/>Prospective observa-<br/>tional study</i> | Nataliello,<br>January, 2021, Italy | 82 patients<br>(mean age<br>58.8 ± 13.2<br>years,<br>68.3% male) | Patients were affected by<br>COVID-19 pneumonia,<br>diagnosed by laboratory test<br>(nasopharyngeal PCR) and<br>suggestive chest imaging.<br>(n, %): (11, 13.4%) smoked,<br>(25, 30.5%) had hypertension,<br>(9, 11%) had diabetes, (4,<br>4.9%) had rheumatic disease,<br>(50, 61%) had a BMI > 25kg/<br>m <sup>2</sup> , (8, 9.8%) had acral symp-<br>toms, (47, 57.3%) required<br>oxygen therapy, (5, 6.1%) were<br>admitted to the ICU (21,<br>25.6%) received Anti-IL6R<br>therapy, (39, 47.5%) received<br>enoxaparin therapy, (8, 9.8%)<br>had PTE or DVT. | Duration from<br>onset of<br>symptoms<br>was 37.3 ±<br>23.1 days | Abnormalities classifiable as non-<br>specific patterns in 53 patients<br>(64.6%).<br>Findings: Precapillary edema<br>(80.5%), enlarged capillaries<br>(61%), sludge flow (53.7%), mean-<br>dering capillaries and reduced cap-<br>illary density (50%).<br>Acute COVID-19 patients, com-<br>pared to recovered patients,<br>showed higher prevalence of<br>hemisiderin deposits as a result of<br>micro-hemorrhages ( $p = .027$ ),<br>micro-thrombosis ( $p < 0.016$ ),<br>sludge flow ( $p = 0.001$ ) and pre-<br>capillary edema ( $p < 0.001$ ).<br>Recovered patients showed higher<br>prevalence of enlarged capillaries<br>( $p < 0.001$ ), loss of capillaries<br>( $p = 0.002$ ), meandering capillaries<br>( $p < 0.001$ ), and empty dermal<br>papillae. | Unknown                               |                        |
| <i>Studies describing nail involvement with chilblains-like manifestations of COVID-19</i><br><i>Subungual erythema<br/>Two cases of<br/>COVID-19 presenting<br/>with a clinical picture<br/>resembling chilblains:<br/>first report from the<br/>Middle East<br/>Case series</i>   | Alamthan,<br>May, 2020,<br>Kuwait*  | 27-year-old<br>female and<br>35-year-old<br>female               | PCR positive in both patients,<br>patients had reported recent<br>travel to UK.<br>No additional information pro-<br>vided on disease course or<br>treatment   | Unknown  | Red-purple papules on the dorsal<br>aspect of the fingers on both<br>hands; patient 2 had diffuse<br>erythema in the <b>subungual area<br/>of her right thumb</b>  | Unknown                               |                        |

**Table 1** Continued

| Nail finding<br>Study title  | Author, month,<br>year, country | Patient<br>characteristics  | COVID-19 disease<br>course/associated<br>symptoms<br>and treatment   | Onset of nail<br>symptoms and<br>resolution  | Detailed description<br>of cutaneous and nail findings   | Time to nail<br>symptom<br>resolution   | Additional<br>Comments |
|--|---------------------------------|---|--|--|--|---|------------------------|
| Periungual erythema<br><i>Chilblains in children<br/>in the setting of<br/>COVID-19 pandemic</i><br>Retrospective case<br>series | Ardina, May, 2020,<br>Spain*    | 22 patients (13 male,<br>9 female); median<br>age: 12 (range: 6–17) | Respiratory symptoms (cough<br>or rhinorrhea) (9, 41%), GI<br>symptoms (abdominal pain or<br>diarrhea) (2, 9%), shortness of<br>breath 0, fever 0.<br>Household contact with proba-<br>ble case of COVID-19 (2<br>(55%), confirmed case of<br>COVID-19 (1 (4%).<br>PCR positive in 1, negative in<br>18. | Duration of<br>lesions before<br>consultation<br>ranged from 1<br>to 28 days<br>(median 7 days). | Feet affected in all 22 cases:<br>acrally located, erythematous-<br>violaceous or purpuric macules on<br>the toes and lateral aspects of the<br>feet and heels. <b>The tips and<br/>periungual or distal subungual</b><br>areas of the toes were commonly<br>involved. <b>3 patients showed<br/>similar lesions on fingers,</b><br><b>located predominantly on<br/>periungual areas.</b> | Lesions showed<br>marked<br>improvement<br>or almost complete<br>resolution 3–5<br>weeks after onset. |                        |

**Table 1** Continued

| Nail finding<br>Study title   | Author, month,<br>year, country          | Patient<br>characteristics                                     | COVID-19 disease<br>course/associated<br>symptoms<br>and treatment   | Onset of nail<br>symptoms and<br>resolution   | Detailed description<br>of cutaneous and nail findings   | Time to nail<br>symptom<br>resolution | Additional<br>Comments                                  |
|---|--|--|--|---|--|---------------------------------------|---|
| Erythematous<br>macules around the<br>distal nailfolds<br><i>Clustered cases of<br/>acral periosis: Clinical<br/>features, histopathology, and<br/>relationship to<br/>COVID-19<br/>Case series</i> | Cordoro, May,<br>2020, United<br>States* | 6 patients<br>(age range:<br>12–17 years;<br>5 male, 1 female) | 2 siblings from one family<br>reported rhinorrhea,<br>congestion, sore throat, and<br>subjective fevers 1 week prior<br>to onset of skin lesions; none<br>of the patients had cough,<br>shortness of breath, or<br>changes in smell or taste.<br><br>All 6 patients had contact with<br>adults who had mild, transient<br>upper respiratory infection<br>symptoms 1–2 weeks prior to<br>the onset of skin lesions. None<br>had known contact with con-<br>firmed COVID-19 cases. | 1 week after<br>presentation of<br>other COVID-19<br>systemic symptoms<br>and/or contact with<br>adults who had<br>mild upper respiratory<br>infection symptoms | Nearly all described lesions as<br>itchy and few reported tenderness<br>in context of swelling. Red<br>violaceous macules and dusky,<br>purpuric plaques scattered on the<br>mid and distal aspects of toes.<br><br>More severely affected digits were<br>edematous with overlying<br>superficial bullae and focal<br>hemorrhagic crust. None of the<br>digits appeared ischemic or<br>necrotic. Several patients had<br>scattered petechial and purpuric<br>macules on the heels, soles, and<br>distal aspect of the dorsal feet and<br>a predominant distribution along<br>the lateral foot, <b>a few had subtle<br/>erythematous macules around<br/>the distal nailfolds</b> . Half had<br>livedo reticularis involving the<br>flexor surfaces of the forearms,<br>dorsal hands, and dorsal feet. | Unknown                               | All PCR negative.<br>COVID-19 IgM-<br>and IgG negative. |

**Table 1** Continued

| Nail finding<br>Study title  | Author, month,<br>year, country                | Patient<br>characteristics   | COVID-19 disease<br>course/associated<br>symptoms<br>and treatment  | Onset of nail<br>symptoms and<br>resolution   | Detailed description<br>of cutaneous and nail findings  | Time to nail<br>symptom<br>resolution | Additional<br>Comments   |
|--|--|--|---|---|---|---------------------------------------|--|
| Paronychia<br><i>Are chilblain-like<br/>acral lesions really<br/>indicative of COVID-<br/>19? A prospective<br/>study and literature<br/>review</i><br>Prospective study           | Docampo-Simon,<br>September,<br>2020, Spain    | 58 patients (median<br>age: 14, range<br>3 months–85 years),<br>male 29 (50%),<br>female 29 (50%). | Experienced COVID<br>symptoms: Yes (11, 21.2%),<br>No 41 (78.8%).<br>Exposure or contact with con-<br>firmed case 12 (21.8%), sus-<br>pected case 7 (12.1%), none<br>36 (65.5%). PCR positive in 1<br>(1.7%). | Time from<br>development<br>of lesions to PCR<br>test: median 12 days,<br>range 1–28 days;<br>time from COVID-<br>19 symptoms to<br>development of<br>lesions (n = 11),<br>median 7 days<br>(0–42 days) | Hands (9, 15.5%), feet (36, 62.1%),<br>hands and feet (13, 22.4%).<br>Symptoms: pain (17, 32.1%),<br>pruritus (20, 37.7%), pain and<br>pruritus (5, 8.6%), asymptomatic<br>(11, 20.8%).<br>Morphology: chilblain-like (42,<br>72.4%), purpuric (3, 5.2%), macu-<br>lopapular (3, 5.2%), vesiculobul-<br>lous (3, 5.2%), eczematous (3,<br>5.3%), <b>paronychia</b> (2, 3.4%), ulcer<br>(1, 1.7%), desquamation (1, 1.7%). | Unknown                               | Blood analysis<br>revealed elevation<br>of IgA, PCR<br>negative.<br>Serologies<br>showed positive<br>IgG, negative<br>IgM. |
| Periungual erythema<br><i>Histological findings<br/>in chilblain lupus-like<br/>COVID lesions: in<br/>search of an answer<br/>to understand their<br/>aetiology</i><br>Case report | Rodriguez-Villa Lario,<br>October 2020, Spain* | 17-year-old male   | Caregiver to patient<br>convalescing from COVID<br>pneumonia  | 2 days of evolution   | <b>Periungual erythema in second<br/>and third finger toe:</b> 2 days of<br>evolution   | Unknown                               |  |

**Table 1** Continued

| Nail finding<br>Study title   | Author, month,<br>year, country                 | Patient<br>characteristics       | COVID-19 disease<br>course/associated<br>symptoms<br>and treatment   | Onset of nail<br>symptoms and<br>resolution   | Detailed description<br>of cutaneous and nail findings  | Time to nail<br>symptom<br>resolution | Additional<br>Comments                                   |
|---|---|----------------------------------|--|---|---|---------------------------------------|--|
| Perungual erythema<br>and onychomadesis<br><i>Are SARS-CoV-2 IgA<br/>antibodies in paed-<br/>iatric patients with<br/>chilblain-like lesions<br/>indicative of COVID-<br/>19 asymptomatic or<br/>paucisymptomatic<br/>infection?</i><br>Prospective study | Diociaiuti,<br>January, 2021, Italy*            | 30 patients<br>(all adolescents) | 17 patients (group A),<br>belonged to previous published<br>series (2 lost to follow up),<br>underwent second serology<br>testing for SARS-CoV-2. Group<br>B consisted of 13 new patients<br>who underwent PCR and<br>serology.                | Fever, headache,<br>sore throat, 1<br>month before<br>(1 patient); fever,<br>2 months before<br>(1 patient); sore<br>throat, fever,<br>diarrhea, 1.5<br>months before<br>(1 patient); fever<br>cough, 2 months<br>before (1 patient);<br>flu-like symptoms,<br>1 month before<br>(2 patients);<br>asthenia, headache,<br>1 month before<br>(1 patient);<br>asymptomatic<br>with positive PCR,<br>1 month before<br>(1 patient);<br>negative (20 patients) | Group B: 3 patients reported flu-<br>like symptoms 3–4 weeks before<br>skin lesion, 1 patient developed<br>chilblain after proving positive to<br>SARS-CoV-2; other patients<br>presented cutaneous<br>manifestations 2–8 weeks before<br>screening visit.<br>All patients presented with swell-<br>ing, erythematous-violaceous-pur-<br>puric macules, pustules and crusts<br>on the toes, in some cases the<br>heels, lateral foot aspect and soles | Unknown                               |  |
| Peeling around the<br>nails<br><i>What are COVID<br/>toes? A case study</i><br>Case report  | Beuscher, December,<br>2020, United States*     | 45-year-old<br>female            | March 12 2020: Patient<br>presented with diarrhea, dry<br>cough, sore throat, eye<br>irritation, swollen lymph nodes,<br>abdominal pain, intermittent<br>hypoxia as low as 84, chest<br>pain during deep inhalation,<br>altered sense of smell | 7 days after<br>altered sensations<br>(neuropathic-type<br>symptoms)<br>in her feet   | April 19: Presented with hot and<br>itchy and tingling toes and <b>peeling</b><br><b>around the nails</b> .   | Symptoms<br>ongoing<br>after 21 days  | COVID test<br>negative 21<br>days after<br>symptom onset |
| Nail fold<br>telangiectasia<br><i>COVID-19 associ-<br/>ated chilblain-like<br/>lesions in an asymp-<br/>tomatic doctor</i><br>Case report   | Hadjieconomou,<br>July 2020, United<br>Kingdom* | Woman, no<br>age provided        | No other symptoms described.   | Cutaneous<br>symptoms started<br>2 days before<br>COVID-19<br>diagnosed in<br>her partner.  | 2-week history of burning, itching of<br>her fingers and toes, with<br>erythematous and purple papules.<br>Erosion present on her fingers, and<br><b>nail fold telangiectasia</b> was seen.   | Unknown                               |  |

**Table 1** Continued

| Nail finding<br>Study title   | Author, month,<br>year, country   | Patient<br>characteristics                   | COVID-19 disease<br>course/associated<br>symptoms<br>and treatment | Onset of nail<br>symptoms and<br>resolution | Detailed description<br>of cutaneous and nail findings  | Time to nail<br>symptom<br>resolution | Additional<br>Comments   |
|---|-----------------------------------|--|--|---|---|---------------------------------------|--|
| Dermoscopy features<br>of nails in patients<br>with chilblains<br><i>Dermoscopy features<br/>of COVID-19 related<br/>chilblains in children<br/>and adolescents<br/>Prospective study</i> | Navarro, December,<br>2020, Spain | 12 patients<br>(children and<br>adolescents) | No other symptoms described.                                       | Unknown                                     | Background area present in all cases; predominant color was red in 18 pictures, brown in 11, purple in 10, grey in 2; most pictures (31) contained areas of other colors within the areas whereas in 10 (24.4%) there was only one homogenous color present; globules seen in 38 (92.7%) and prominent in 32, mild in 6; reticule observed in 12 images (29.3%); other features found were splinter hemorrhages in nails (3 image), dilated capillaries in nail folds with loss of polarity (2 images) and subconical hemorrhagic dots (1 image). | Unknown                               | 41 dermoscopy pictures obtained from 12 patients. Three main dermascopic features described: a background area, globules, and reticule. Background area is the predominant background color in the lesion (ranging from red, purple, brown to grey); globules are round oval structures of red to purple color; the network reticule is a mesh of grey-brown interconnected lines usually located peripherally within the background macule. |

\*Not included in the references as only 10 references are allowed as per the letter format.



**Figure 1** (a) Onychomadesis involving all toenails. This picture was taken 4 months after the patient was hospitalized for 30 days, including 10 days in ICU, because of severe COVID-19 infection. (b) Chilblain-like lesions, located distally on the fingers around the nail folds (Courtesy of Dr. Maria Pia De Padova, Bologna, Italy). (c) Nail plate dermoscopy showing leukonychia and dilated and tortuous capillaries. This picture was taken 3 months after patient had a mild COVID-19 infection. FotoFinder® 50X. (d) Red discoloration of the nail arranged in a convex half-moon shape, located distally on the lunula. In this patient, this was associated with orange discoloration of the distal nail plate. All fingernails were affected. This picture was taken 2 months after the patient had COVID-19 infection not requiring hospitalization.

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